Claims

1. A coating process comprising: (A) applying to a surface a coating composition consisting essentially of an alkali metal silicate and an aqueous liquid phase having dispersed therein solid aluminum particles to form on the surface a wet coating; and (B) drying said wet coating: (i) under conditions which convert said wet coating to an electrically conductive, corrosion-resistant, solid coating; or (ii) under conditions which form a solid coating which is not electrically conductive (non-conductive) and thereafter treating said non-conductive coating under conditions which convert said non-conductive coating to an electrically conductive, corrosion-resistant coating.

2. A process according to Claim 1 wherein the surface is metallic.

3. A process according to Claim 2 wherein said wet coating is dried under said conditions of (i).

4. A process according to Claim 2 wherein said wet coating is dried under said conditions of (ii).

5. A process according to Claim 4 including burnishing the non-conductive coating for a sufficient period of time to convert it to a conductive coating.

6. A process according to Claim 2 wherein the coating composition is applied to the metallic surface of a part of a turbine engine.

7. A metallic or ceramic surface coated with an electrically conductive, aluminum-containing silicate coating.

8. A metallic surface according to Claim 7 wherein the coating has a thickness of about 0.8 mil to about 3.5 mils and corrosion-resistant properties characterized by no greater than about 1.6 mm loss of adhesion at scribe when subjected to 5% neutral salt spray at 95°F for about 1000 hours according to ASTM B-117.

9. A metallic surface according to Claim 7 wherein said coating has heat-resistant properties characterized by its being substantially free of cracks, checks, and blisters when the surface is subjected to the following conditions: heat treatment for 23 hours at a temperature of about 700°F, followed by heat treatment for 4 hours at a temperature of about 1075°F.

10. A metallic surface according to Claim 7 wherein said coating has flexibility properties characterized by its being substantially free of flaking or loosening when subjected to the following conditions: bending a panel coated with the coating through an angle of 90° around a 1/4 inch diameter mandrel.

11. A metallic surface according to Claim 7 wherein said coating has hydraulic oil-resistant properties characterized by its being free of peeling, blistering, or softening when the part is subjected to the following conditions: immersion in Mil-L-7808 oil for 8 hours at a temperature of about 400°F.

12. A process for converting a solid silicate coating which contains aluminum particles, which is adhered to a surface, and which is not electrically conductive (non-conductive) to a conductive coating by: (A) subjecting the non-conductive coating to conditions which effect expansion of the aluminum particles to place them into intimate contact with one another to the extent that the coating is rendered electrically conductive; or (B) subjecting the non-conductive coating to a force which is sufficient to compress the particles into more intimate contact with one another to the extent that the coating is rendered electrically conductive.

13. A coating composition which is effective in forming on a metallic or ceramic surface a corrosion-resistant coating and which consists essentially of (a) an alkali metal silicate, (b) an aqueous liquid phase having dispersed therein solid aluminum particles, and (c) an additive which is effective in improving the corrosion-resistance of the coating and which is selected from the group consisting of (i) an organic solvent which is partially miscible or immiscible in water; (ii) an organofunctional silane, and (iii) a mixture of said additives.

14. A composition according to Claim 13 wherein the additive is an organic solvent which has a miscibility in water of about 1 ml to about 20 ml of solvent per 100 ml of water at about 20°C.

15. A composition according to Claim 14 wherein the solvent has a miscibility in water of up to about 10 ml.

16. A composition according to Claim 15 wherein the solvent has a miscibility in water of up to about 5 ml.

17. An aqueous coating composition which is effective in forming a corrosion-resistant coating on a metallic or ceramic surface and which consists essentially of aluminum particles dispersed in the composition and a mixture of sodium silicate and lithium silicate, the total silicate content of the composition being about 2.5 wt. % to about 30 wt. % and the weight ratio of sodium silicate to lithium silicate being about 0.25 to 1 to about 4 to 1.

18. A composition according to Claim 17 wherein the total silicate content of the composition is about 7 wt. % to about 13 wt. %.

19. A process for forming a multi-ply coating on a metallic or ceramic surface by applying thereto an aqueous coating composition consisting essentially of an alkali metal silicate and having dispersed therein solid aluminum particles in which (A) the composition is applied to the surface to form thereon a layer of wet coating; and (B) the layer of wet coating is air-dried; (C) the composition is applied to the surface of the air-dried coating to form thereon an overlying layer of wet coating; and (D) said overlying layer of wet coating is (i) dried under conditions which convert said wet coating to an electrically conductive, solid corrosion-resistant multi-ply coating or (ii) said wet coating is dried under conditions which form a solid multi-ply coating which is not electrically conductive (non-conductive) and said non-conductive multi-ply coating is thereafter treated under conditions which convert said non-conductive coating to an electrically conductive, corrosion-resistant, multi-ply coating.